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of President M. T. Bogert of the American Chemical Society on "The Function of Chemistry in the Conservation of our Natural Resources," and of H. P. Talbot, vice-president of Section C of the American Association for the Advancement of Science, on "Science Teaching as a Career."

Over one hundred and sixty papers were announced and read before the nine different sections into which the meeting was divided. Many of these papers were of far-reaching interest and the sections were fully attended. It is probable that no one of the sections was more enthusiastic than the recently organized Division of Industrial Chemists and Chemical Engineers, which was in session on four separate days and whose meetings were unusually enthusiastic. The paper of E. G. Bailey, on "Accuracy in Sampling Coal," proved of such great interest to the members that the discussion was allowed to continue for over two hours and the paper of W. H. Walker, describing a new method of quickly finding imperfectly covered spots on tin plate, aroused almost equal discussion and interest among the chemists present.

The Section of Physical and Inorganic Chemistry, the Section of Agricultural and Food Chemistry, the Section of Organic Chemistry and the Section of Fertilizer Chemistry having petitioned the council for permission to organize as divisions of the American Chemical Society the following divisions were authorized and have organized and elected officers: Division of Physical and Inorganic Chemistry, Division of Agricultural and Food Chemistry, Division of Organic Chemistry, Division of Fertilizer Chemistry.

CHARLES L. PARSONS,
Secretary

THE THIRTY-NINTH GENERAL MEETING
OF THE AMERICAN CHEMICAL SOCIETY
AND THE MEETING OF SECTION C OF
THE AMERICAN ASSOCIATION FOR
THE ADVANCEMENT OF SCIENCE

THE thirty-ninth general meeting of the American Chemical Society and Section C of the American Association for the Advancement of Science was held at the Woman's College in Baltimore from Tuesday, December 29, to Friday, January 1, 1908-9.

On Tuesday morning Section C was organized and this was followed by the opening session of the American Chemical Society. After the general meeting in the afternoon the following addresses were given before the Section of Chemical Education:

The Efficiency and Deficiencies of the College-trained Chemist when Tested in the Technical Field: WILLIAM H. NICHOLS.

To what Extent should College Training Confer Practical Efficiency along Technical Lines: LOUIS M. DENNIS.

The Attitude of Technical Institutions to Post-graduate Study: WILLIAM MCMURTRIE.

This section was well attended and the greater part of the afternoon was spent in the discussion of the papers.

On Tuesday evening a complimentary smoker was given at the Belvedere Hotel by the Baltimore Section of the society. The smoker was preceded by an illustrated lecture on the "Lumiere Process of Color Photography," by William Simon.

On Wednesday afternoon excursions were made through the Naval Academy at Annapolis; through Sharp and Dohme's drug factory, and also the Baltimore breweries.

On Thursday evening a subscription dinner was given at the Belvedere Hotel. This proved to be one of the most pleasant events of the meeting.

On Friday afternoon an excursion was made through the Maryland Steel Works.

On Saturday many of the chemists visited the Bureau of Standards and Geophysical and other laboratories in Washington.

The following addresses were given before the general assembly:

The Function of Chemistry in the Conservation of our Natural Resources: President M. T. BOGERT.

The Untilled Fields of Chemistry: A. D. LITTLE.
The Use and Abuse of the Ionic Theory: GILBERT N. LEWIS.

Science Teaching as a Career: H. P. TALBOT.

The Work of Werner on the Constitution of Inorganic Compounds: CHAS. H. HERTY.

The Future of Agricultural Chemistry: H. J. WHEELER.

The Quantitative Study of Organic Reactions: S. F. ACREE.

The Classification of Carbon Compounds: EDWARD KREMER.

The following papers were reported before the various sections:

AGRICULTURAL AND FOOD CHEMISTRY

H. J. Wheeler, chairman

Analyses of Milk Products: EDWARD GUDEMAN.

This paper gives comparison of results obtained in the determination of fat, using the standard or official methods and a new method for fat

determination in milk products such as condensed milk, evaporated milk, malted milk, milk powders, milk chocolate, milk cereal products and candies containing milk products or other fats.

The new method suggested is so simplified as to give correct results in the hands of chemists not having special experience in the analyses of such products, besides materially decreasing the time of making analyses. A weighed quantity of the product is dissolved in water or made into an emulsion, the fat and proteids precipitated with copper sulphate, filtered on a fat-proteid free paper, allowed to drain and the damp precipitate on the paper directly extracted with ether. The extracted precipitate is used for making proteid determination by the Kjeldahl method, digesting paper and precipitate. Filtrate from the copper sulphate precipitation is used for determination of sugars and gums. If insoluble starch is present, a weighed filter paper is used and starch determined as difference between total weight of precipitate and proteid and fat found.

Carbohydrates such as starch, dextrines, gums and sugars (cane, maltose, lactose and dextrose) interfere with complete extraction of fat with solvents and in the separation of the fat by the modified Babcock method. Drying the milk product for extraction, direct and after soaking in water, will give low results, due to change in fat during drying (Gudeman, *Proceedings A. O. A. C.*, 1902).

The analyses of milk products containing sugars or cereals or gums are not accurate and it is recommended, therefore, to confine such analyses to the determination of water, ash, fats, proteids, soluble carbohydrates, insoluble carbohydrates and to qualitative examination for starch, dextrine and gum.

The paper reviews the collaboration work done by the A. O. A. C. on condensed milk and evaporated milk during 1907 and 1908.

Effect of Fresh Manure on Denitrification and Plant Growth: E. B. FRED.

This includes the results of field, pot and laboratory experiments with fresh manure containing large amounts of straw. The effect was studied in experiments, where fresh manure was compared with well-rotted manure, with and without the addition of nitrate of soda. The loss due to denitrifying bacteria present in the straw was measured by its effect on plant growth.

The Colorimetric Determination of Nitrates in Soil Solutions containing Organic Matter: W. A. SYME.

Potassium permanganate is added to the hot soil solution, acidified with sulphuric acid, until in excess. The solution is filtered, made alkaline with sodium carbonate and evaporated to dryness on water-bath. The residue is treated with water, filtered and diluted to its original volume. The solution is now ready for the colorimetric determination of nitrates in the usual way with phenol disulphonic acid and ammonia.

There was no nitrate formation by the action of the permanganate on the organic matter.

Change in Composition of Unground Cereals during Storage: SHERMAN LEAVITT and J. A. LECLERC.

Samples of corn, wheat, barley, oats and rye in the unground state were allowed to stand for two years. Every six months samples were drawn for grinding and analysis. The authors found a gradual change in all of the cereals taken. This change becomes more rapid if the samples are ground before aging. The most marked changes are in the content of total sugar, 70 per cent. alcohol soluble proteid, 5 per cent. K_2SO_4 soluble proteid and Stutzer water soluble proteid. Unground corn lost 60 per cent. of its total sugar in two years and its entire germinative power. There was also evidence of a rearrangement of the proteid molecules.

In general corn, barley and oats in the order given were found most subject to a change of sugar content producing a loss. Wheat showed an increase of sugar in two years.

Corn, barley, rye, wheat and oats in the order given show the greatest proteid change.

The Importance of Experience in the Interpretation of the Results of Chemical Analyses: H. H. HANSON.

Incompletely described methods of analysis, unusual variations in materials under investigation, skillful imitations of many important products, and the personal equation of the operator make necessary the most extreme care in interpreting results of chemical analyses. The importance of check determinations with known substances and of repeated trials of unfamiliar methods is illustrated by reference to work upon paris greens, the search for artificial color in various products and examination of maple syrups and sugars and various kinds of vinegars. Unusual variations in the latter are cited and the importance of physical tests emphasized.

Lead Test in Cider Vinegar Analysis: F. A. NORTON.

Attention is called to the varying emphasis given to the lead test in cider vinegar analysis and the reagents employed. The test is shown to be of particular value in the case of a turbidity only being produced on the addition of neutral lead acetate to the vinegar being examined. The turbidity together with failure of the vinegar to give a copious precipitate is due to the presence of the normally insoluble pectinous constituents of the apple marc due to heating either through fermentation or steaming of second pressings or through the employment of badly fermented and heated apples for the manufacture of the vinegar. Increase in the right-handed polarization and of reducing sugars on inversion gives confirmatory evidence as to the presence of second pressings or employment of badly fermented stock. The neutral lead acetate is shown to be more delicate in its reaction than lead subacetate for the lead test, while the addition of alcohol, which is sometimes advocated, is not permissible as alcohol readily precipitates the pectinous bodies causing the turbidity, thus destroying the value of the test.

Normal Occurrence of Boric Acid in Virginia Peanuts: F. A. NORTON.

Reference is made to previous work showing the presence of traces of boric acid in apples, pears, quinces, grapes, pomegranates, peaches, gooseberries, cherries, oranges and lemons. Also in hops, radishes, lettuce, carrots and sugar beets, the maximum amount of boric acid normally occurring which has been reported being .016 per cent. Reference is then made to work at the National Canners' Laboratory, showing the normal occurrence of boric acid in two lots of Virginia peanuts, the amount being .015 per cent.

To Determine Fat in Sweetened Condensed Milk: C. E. COCHRAN.

Weigh out 25 grams of the sample, dissolve in water and make up to 100 c.c. Transfer 6 c.c. to a double-tube milk flask provided with a small-bore tube graduated to give percentage of fat for 5 c.c. milk. Add 4 c.c. of ether and 4 c.c. acetic acid (80 per cent. or more absolute acetic acid). Acetic acid of this strength will dissolve the curd, but has no effect on the sugar. Place the flask in a vessel of warm water and heat until the ether is expelled. A layer of milk fat will now be seen floating on the surface of a clear and colorless liquid. Fill the flask with hot water, thus raising the fat into the graduated tube. The percentage of fat can now be read, the sample whirled in a centrifugal machine and another reading made. Multiply the reading by four.

The Anti-putrescent Effects of Copper Salts: ALFRED SPRINGER.

The peculiar behavior of the "certified and inspected milk" from the largest dairy impressed some of the chemists of this city with the belief that some antiseptic had been added to cause this milk to remain sweet. The milk commissioners and owners of the dairy in question indignantly denied that such was the case. After a long series of tests I found small quantities of copper salts present in all the bottles of certified and inspected milk coming from this dairy; furthermore, traced its presence largely to a boiler compound used, containing copper salts, which primed over in the sterilizing room. The milk is especially abnormal in never becoming putrescent, and showing, when exposed to the atmosphere peculiar growths of molds, which are described in the paper.

Experiments to show the anti-putrescent effects of copper salts with meat, egg and blood albumin, sewage and other substances are also described.

The Composition of the Oregon Hop: C. E. BRADLEY.

A study of typical hop plants with respect to their requirements of the soil gives values for phosphoric acid similar to those reported by Wolff. Nitrogen and potash are, however, less by one half in Oregon samples. Choice fresh hops yield .48 per cent. of oil by steam distillation. The resin content of sixteen commercially graded samples is reported, choice grades giving from 12.32 to 13.75 per cent. soft resin and from 5.35 to 6.59 per cent. hard resin.

The Effect of Low Temperatures upon B. coli and B. typhosus in Sterilized, Artificially Infected Milk: GEO. W. STILES, JR.

This investigation involves a bacteriological study of sterilized market milk artificially infected with pure cultures of *B. coli* and *B. typhosus*. Ninety small Erlenmeyer flasks containing 50 c.c. each of the infected milk were placed at ordinary ice-box (53°-63° F.), chilling (30°-34° F.) and cold-storage (—5°-8° F.) temperatures.

At intervals of three to four days one flask from each lot was removed and the number of colonies determined by plating on plain agar, being incubated four days at 25°-27° C. The initial bacterial content having been determined, the change in numbers varying from this standard are represented diagrammatically.

At ordinary ice-box temperatures the number of organisms, both *B. coli* and *B. typhosus*, multiply

quite rapidly from a few thousand to many millions. Milk infected with *B. coli* did not coagulate within thirty days, except by heating, which was first observed nine days after infection with a bacterial count of 1,000,000,000 per cubic centimeter and acidity of 4 per cent.

Since the investigations are yet incomplete, further conclusions are not deemed advisable at this time.

Abstracts were not received for the following papers:

The Quantity of Copper absorbed in the Process of Greening Vegetables and the Effect thereof on Digestibility: H. W. WILEY and HERMAN SCHREIBER.

The Composition of Concord, Catawba and Scuppernon Grape Juices: H. C. GORE.

A Simple Rapid-process Vinegar Generator for Experimental Purposes: H. C. GORE.

Some Reactions of Coal-tar Colors: C. B. COCHRAN.

Copper Compounds with Protein and their Relative Digestibility: H. W. WILEY and H. SCHREIBER.

Prairie Soil of Unusual Composition: F. J. ALWAY.

The Determination of Essential Oil and Alcohol in Flavoring Extracts: JULIUS HORTVET and RODNEY MOTT WEST.

The Fruit of Medeola Virginica: NICHOLAS KNIGHT and LOIS E. POYNEER.

BIOLOGICAL CHEMISTRY SECTION

J. J. Abel, chairman

Enzymes of Some Lower Fungi: ARTHUR W. DOX.

The enzymes were prepared by growing pure cultures of the molds on a protein-free medium and dehydrating the mycelium by Albert and Buchner's method for "Acetondauerhefe." The *Penicillium* of Camembert cheese was used principally. It was found to contain a protease which digests casein, gelatine and Witte-peptone, but which is without action on ovalbumin, vitellin, fibrin, elastin, edestin and excelsin. Its greatest activity is at the neutral point of methyl orange. It resembles Cohnheim's erepsin and Ascoli's "glutinase." A hippuric acid splitting enzyme was also found which yielded 64 per cent. of the theoretical amount of benzoic acid in twenty-four hours. Two green molds, *Penicillium chrysogenum* Thom and *Penicillium Roqueforti* Thom, both of which answer to Link's description of *Penicillium glaucum*, yielded in the one case 83 per cent. hydrolysis with sodium hippurate and

in the other case no hydrolysis at all. Attention is, therefore, called to the necessity of using definitely identified organisms to make chemical experiments of any value. The numerous carbohydrate-splitting enzymes found in fungi by previous investigators were due in part at least to a breaking down of glycogen contained in the mold extract.

Some of the Fermentative Properties of Bacteria: D. H. BERGEY, M.D.

In a previous paper¹ I reported on a number of bacteria studied by myself and Dr. Deehan with regard to the fermentation of saccharose, dulcitate, adonite and inulin. These carbohydrates were employed because the work of MacConkey indicated that they were of primary importance in the differentiation of bacteria belonging to the *colon aerogenes* group. Subsequent study with regard to the fermentative properties of these bacteria on other carbohydrates demonstrated that an organism without fermentative properties for these four carbohydrates might still not compare with others of similar properties with regard to other carbohydrates. Detailed study has shown that lactose, sorbose, raffinose and dextrin are also of primary importance in the differentiation of this group of bacteria.

I have attempted to ascertain some law concerning the fermentative properties of these bacteria to assist in explaining why one carbohydrate should be acted upon by a particular organism and another carbohydrate of related structure left intact. According to the teaching of Fischer and others, ferments can break up only those carbohydrates that have one or more asymmetrical groups, and in the light of Fischer's teaching the ferment must correspond in configuration to the carbohydrate on which it is acting, in a way similar to the relation of a key to the lock which it opens. We must conceive then that the ferment must likewise possess one or more asymmetrical groups so as to correspond to the configuration of the carbohydrate, or to be enabled to link on to the carbohydrate molecule to form a new chemical combination.

My studies have failed to disclose any constant relation between the carbohydrates fermented by closely related bacteria, and hence no law by which one could foretell what action a certain micro-organism might have on the different carbohydrates.

Abstracts have not been received for the following papers:

¹ *Journal of Medical Research*, Vol. XIX., p. 175.

The Indirect Colorimetric Estimation of Small Amounts of P_2O_5 with Uranium Acetate and Potassium Ferrocyanide: R. B. GIBSON.

Factors which Influence the Determination of Kreatinin: F. C. COOK.

On the Oxidation of Carbon Monoxide: J. H. KASTLE.

The Relations of Magnesium and Phosphorus to Growth in the Fungi: HOWARD S. REED.

Is Platinum Black Capable of Effecting the Hydrolysis of Ethyl Butyrate? A. S. LOEVENHART.

The Absorption and Partial Purification of Catalase from Liver: A. W. PETERS and H. W. STEWART.

The Diastatic Enzyme of Ripening Meat: A. W. PETERS and H. A. MATTILL.

The Influence of the Isomers of Salicylic Acid on Metabolism: E. W. ROCKWOOD.

Surface Tension as a Factor in the Distribution of Salts in Animal and Vegetable Cells: A. B. MACALLUM.

Esterification of the Bile Acids: ISAAC KING PHELPS.

Estimation of Total Sulphur: ISAAC KING PHELPS.

A Study of Nylander's Reaction: M. E. REHFUSS and P. B. HAWK.

The Determination of Iodine in Protein Combinations: L. W. RIGGS (by invitation).

A Distributing Factor in Barfed's Test: WILLIAM H. WELKER.

DIVISION OF INDUSTRIAL CHEMISTS AND CHEMICAL ENGINEERS

A. D. Little, chairman

The Munroe Crucible: WALTER O. SNELLING.

The use of platinum felt as the filtering medium in a crucible of the Gooch pattern was first suggested by Professor Charles E. Munroe, in an article entitled "Filtration with Filters of Metallic Felt" published in the *Journal of Analytical Chemistry*, Vol. 2, part 3, July, 1888.

Crucibles prepared by the method suggested by Professor Munroe have many advantages not possessed by any other type of apparatus used for filtration. These filters retain the finest precipitates, and owing to the fact that no other material than platinum enters into the construction of the filter, no impurity other than this metal can contaminate the filtrate, and thus in very exact work a very great advantage is gained through the use of the Munroe crucible.

A series of tests were described, showing that the porosity of the mat of the Munroe crucible

was many times greater than that of the asbestos mat in crucibles of the usual type. The preparation of the crucible was described, and a number of experiments were mentioned showing the wide range of applications for which the crucible was suited, and the many classes of work in which it has been found to be superior to other types of filtering apparatus.

The Rapid Determination of Moisture in Commercial Products of a Viscous or Semi-solid Consistency: ARTHUR LOWENSTEIN.

The author states that "the method employed consists merely in the application of several well-known principles, viz., the addition of a dehydrating agent of a lower boiling point than water, in which the material to be desiccated is wholly or in part soluble, or at least miscible. The reagent employed is ordinary 95 per cent. ethyl alcohol. In the case of materials containing soluble proteins, the alcohol acts in some cases as a coagulant, and in others as a precipitant, which action facilitates the drying process. A definite quantity of the material is weighed into a metal dish, $2\frac{1}{2}$ inches in diameter, together with a short glass stirring rod, 15 c.c. of alcohol added; stirred thoroughly; evaporated on steam bath; another portion of alcohol added and similarly evaporated. Dish then transferred to jacketed oven at 105° C. and dried to constant weight. Total period of drying, $1\frac{1}{2}$ - $2\frac{1}{2}$ hours. Table gives results of tests on meat extracts, concentrated glue solutions, concentrated tank water, inspissated ox gall, dye-wood extracts, syrups, various kinds of cheese, etc.

An Unusual Incrustation on Generator Coils: E. H. EHRENFELD.

On the generator coils of a refrigeration plant of the absorption type there was formed a hard, semi-crystalline scale about one sixteenth of an inch thick. Its texture was very compact, its density 5.117, and on being tapped it gave almost a metallic sound.

It was formed on the outside of two-inch iron pipes through which steam circulated. The pipes were surrounded by strong aqua ammonia, and it was from this ammonia that the scale was deposited. A part of the circulation system having been constructed of galvanized iron, zinc was taken up by the ammonia and the scale deposited therefrom contained over 90 per cent. of zinc oxide.

Abstracts have not been received for the following papers:

Rapid Analysis of Babbitt Metal: PERCY H. WALKER and H. A. WHITMAN.

- The Unsaponifiable Matter in the Oleo-resins of Conifers*: CHAS. H. HERTY and W. S. DICKSON.
Acceleration Tests of the Resistance to Corrosion of Iron and Steel: ALLERTON S. CUSHMAN.
The Changes in Crude Petroleum Effected by Diffusion through Clay: DAVID W. DAY.
Further Remarks on Vanadium and its Estimation: GEORGE AUCHY.
Iron, from a Chemical and Commercial Standpoint: PAUL N. CLANCY.
An Unusual Incrustation on Generator Coils: C. H. EHRENFELD.
Principles Underlying Efficient Grinding and Separating: W. H. WALKER.
The Purchase of Material on Specification: H. J. SKINNER.
Some Industrial Applications of the Ives Colorimeter: F. A. OLMSTEAD.
Factors determining the Efficiency of Trolley Wires: C. F. WOODS.
The Iodine Number and some other Values for China Wood Oil: E. W. BOUGHTON.
Accuracy in Sampling Coal: E. G. BAILEY.
The Storage of Beef at Temperatures above the Freezing Point: W. D. RICHARDSON.
Observations on the Freezing Out of Colloids with Reference to Frozen Meats: W. D. RICHARDSON.
Observations on Certain Stains applied to Frozen and Unfrozen Muscular Tissue: W. D. RICHARDSON.
Frozen Poultry: W. D. RICHARDSON.
Observations on the Best Methods of Cold Storage: W. D. RICHARDSON.
The Commercial Manufacture of Amorphous Calcium Phosphide: CHARLES E. MUNBOE.
The Distribution of Nitrate of Soda in the United States: CHARLES E. MUNBOE.
Standard Methods for Determining and Recording the Relative Permanency or Resistance of Coloring Matter to the Common Color Destroying Agencies: L. A. OLNEY.
Standardization of Methods for Commercial Analysis of Fats, Greases, etc., and Adoption of Rational Nomenclature for Same: A. G. STILLWELL.
Guayule and Guayule Rubber: THEODORE WHITTELSEY.
Lubrication and Lubricants: C. F. MABERY.

FERTILIZER CHEMISTRY SECTION

F. B. Carpenter, chairman

- Some Points of Interest in Connection with Present Fertilizer Laws and Proposed Fertilizer Legislation*: ARTHUR LOWENSTEIN.

The author first indicates the points which are

at present uniform in the various state fertilizer laws. He next points out in detail the lack of uniformity in these laws, and states that this is due not so much to lack of uniformity in the basic principles of the laws, but rather in the elaboration of the principles, and the mode of expression of the details. Quotations are made from the 1907 report of the Committee on Fertilizer Legislation of the A. O. A. C., in which this committee favors national fertilizer legislation, after certain specified difficulties have been overcome. The point next discussed is, if a national law were enacted, whether it would bring about the harmony and uniformity desired or not. The author points out why, in his opinion, it would not. He proposes a uniform state fertilizer law and recommends that a committee be selected by the Division of Fertilizer Chemists of the American Chemical Society to confer with similar committees from the A. O. A. C., National Fertilizer Association and the Association of Agricultural Colleges and Experiment Stations, with a view to drafting a uniform state fertilizer bill—all parties concerned being represented on this joint committee. Then if a national law is desired or necessary for the control of interstate commerce, work for the adoption and passage by congress of this uniform law.

Potash Experiments in Factory Work showing Heavy Loss by Official Method and Possible Means of Preventing this Loss: J. E. BRECKENRIDGE.

A brief history of the work of the Association of Official Agricultural Chemists on potash during recent years, showing loss of potash by official method.

Methods used to find this lost potash explained with results on thirteen samples. Some methods used:

No. 3. (a) Same as Carpenter method, except 1 per cent. citric acid solution was used for solvent instead of 5 c.c. HCl in 300 c.c. water.

No. 11. Washed 2 grams on 11 cm. filter with small portion of hot water into a 200 c.c. flask to about 175 c.c., when no chlorid or soluble sulphate should be left in residue on filter. Add .6 gram citric acid to flask, heat contents of flask to boiling, add ammonia and ammonium oxalate and proceed as in official method.

No. 12. Same as No. 11, only use 3 c.c. HCl in place of .6 gram citric acid.

No. 13. Same as No. 11, only do not add any citric acid.

Abstracts have not been received for the following papers:

The Fertilizer Industry—An Historical Sketch: F. B. CARPENTER.

A Comparison of Various Methods in bringing about the Solution of Potash in Mixed Fertilizers and Tobacco Stems: M. H. PINGREE.

A Discussion of Methods for Determining the Availability of Phosphoric Acid in Thomas Phosphate Powder: GEO. D. LEAVENS.

A Discussion of Methods for the Determination of Iron and Alumina in Phosphate Rock: F. P. VEITCH.

Note on the Determination of Insoluble Phosphoric Acid: F. B. CARPENTER.

Chemistry and Geology of the Inland Phosphates of the United States: LUCIUS P. BROWN.

Loss of Potash in Commercial Fertilizers: F. B. PORTER.

Remarks on the Gladding Method for Phosphoric Acid (weighing direct the phospho-molybdate precipitate): A. G. STILLWELL.

PHARMACEUTICAL CHEMISTRY SECTION

Edward Kremers, chairman

Determination of Acetanilid in Hydrogen Peroxide Solutions: ELWYN WALLER.

In a side neck flask of 200 c.c. capacity, place about half a stick of caustic potash or soda (6 to 7 grams). Add about 20 c.c. of water to dissolve, and then 25 to 30 grams of granulated metallic zinc. Then add a measured amount, not over 50 c.c. of the solution to be tested. Connect the flask on the one side with a flask to supply steam, arranging the tube to deliver steam near the bottom of the solution; connect on the other side with a condenser. The condenser should deliver into a Peligot bulb tube or some other arrangement by which the distillate is immediately brought in contact with moderately strong hydrochloric acid.

Raise the heat on the flask slowly, and when nearly half of the contents have distilled over, start the steam to passing through. The end of the distillation is a matter of guess. When the anilin is coming over in quantity, fumes are to be seen in the receiver, but for the last portions they can not be seen. When it is judged that all has come over, detach the receiver and catch what comes over later in a fresh receiver or a beaker, and titrate it separately.

To prepare the volumetric bromine solution, dissolve 25 grams of caustic potash in 20 to 40 c.c. of water, cool, and add liquid bromine until it appears supersaturated. Then dilute to about 200 c.c. and boil out excess of bromine (judged

by the color). Cool, and dilute to one liter. This should give a solution of which 1 c.c. = nearly 0.01 gm. acetanilid. Standardize by means of a solution containing 0.5 gm. acetanilid in 200 c.c. of water, using 30 to 50 c.c. lots at a time, treated either by distillation on the manner above given, or by boiling with strong hydrochloric acid. Either method was found to give the same result with the same amount of acetanilid.

The method was tested by first distilling known quantities of the sample and titrating the distillate, then adding known amounts of acetanilid to the same quantities of the sample, and distilling. The distillates took just the additional amount required by the acetanilid added.

The presence of acetanilid was indicated by obtaining the isonitril reaction on the original sample.

Recent Developments in Preparations for Administering Sulphur: ELWYN WALLER.

This paper discusses the reasons why attempts are being made to obtain sulphur in an unoxidized but soluble condition. The therapeutic effects of sulphur seem to be inversely proportional to the degree of oxidation.

Sulphur in solid form does not lend itself readily to absorption. The ordinary solvents of sulphur have therapeutic effects of their own and are not desirable for use.

Lac sulphuris leaves much to be desired. These facts have caused the appearance of preparations of colloidal sulphur. It is claimed these are the equal of lac sulphuris and are soluble in water.

Analysis of two such preparations are as follows (results were in grams per 100 c.c.):

Total sulphur	3.05
Lime	1.51
Residue on evaporation	4.94

Lime appeared to be the only base, and no sulphate was present, the sulphur was probably present as in the lac sulphuris.

A second sample soluble in water contained sulphur probably as sodium sulphite. This sample contained resin probably as solvent for the sulphur. The presence of hydrogen sulphide could not be established in either sample.

Abstracts have not been received for the following papers:

The U. S. P. Method for Making Precipitated Sulphur: EDWARD KREMERS.

The U. S. P. Test for Petroleum in Turpentine Oil, and the New Process Oils: EDWARD KREMERS.

A New Method for Alkaloidal Determinations with Mercuric Potassium Iodide: G. HEIKEL.

INORGANIC CHEMISTRY SECTION

Charles H. Herty, chairman

Denudation in the United States: R. B. DOLE and H. STABLER.

This paper presents computations of the rate at which the earth's crust is being moved as solid particles carried in suspension by streams and as matter carried in aqueous solution. The computations are based on twenty years' stream gauging work at 1,500 stations and about 5,000 water analyses by the Water Resources Branch of the U. S. Geological Survey, supplemented by stream gauging data of the Engineer Corps, U. S. A., and the Weather Bureau and by some miscellaneous analyses from state and municipal reports. Except the estimates for the Northern Pacific, Great Basin and Hudson Bay areas, for which the data are rather meager, the figures are believed to be within twenty per cent. of the correct average values. Estimates for over one hundred secondary drainage basins were computed.

If denudation in the Great Basin is taken as zero, the figures for the entire United States are as follows: Tons of solids removed per square mile per year, dissolved, 87; suspended, 166; amounting to a total of 270 million tons of dissolved and 513 million tons of suspended matter per year; equivalent to 1,330 millionths of an inch per year, or one inch in 760 years.

A Spectroscopic Method for Determining Small Amounts of Lithium: W. W. SKINNER.

The separation and determination of lithium, when present in very small amounts, or when the ratio of sodium and potassium to lithium is high, are accomplished with very considerable difficulty. This method proposes the use of the spectroscope under definite conditions for this purpose, the idea being that the brilliancy and length of duration of the lithium spectrum are, within certain limits, proportional to the quantity of material introduced into the flame.

Classification of the Elements for Arranging References to Articles: A. L. VOEGE, Concilium Bibliographicum, Zurich, Switzerland. (Presented by W. C. Bray, Massachusetts Institute of Technology, Boston.)

Mr. Voegel has been engaged for a number of years in adapting the Dewey system of classification to the subject of electro-chemistry. He desires to use a classification of the chemical elements that will be satisfactory to chemists, and is

anxious to receive expressions of opinion from the American Chemical Society and its individual members on the four different classifications which he has prepared. In two of these the elements are separated into metalloids and metals; in the other two the ordinary periodic system, and the Werner periodic system, respectively, are followed. After considerable discussion, the matter was referred to the council of the society. Circulars describing the different arrangements, which arrived too late for distribution at the meeting, may be obtained from Mr. Bray.

Abstracts were not received for the following papers:

Preliminary Note on a New Volumetric Method for the Determination of Cerium in the Presence of other Rare Earths: F. J. METZGER.

Standards of Volumetric Analysis: LAUNCELOT W. ANDREWS.

The Iodometric Determination of Sulphates and that of Sulphur in Coal or in Organic Compounds: LAUNCELOT W. ANDREWS.

The Supposed Presence of Iodate in Commercial Potassium Iodide—an Illusion: LAUNCELOT W. ANDREWS.

Erbium and its Companions (preliminary paper): CHARLES JAMES.

The Transformation of other Forms of Carbon into Graphite: WILLIAM C. ARSEM.

Electrolytic Estimation of Lead, using the Mercury Cathode: M. HUME BEDFORD.

A Method for the Preparation of Standard Hydrochloric Acid: G. A. HULETT and W. B. BANNER.

The Atomic Weight of Lithium: THEODORE W. RICHARDS and HOBART H. WILLARD.

The Basic Nitrates of Magnesium: CHARLES L. PARSONS and GEO. A. PERLEY.

Barium Sulphate in Analysis in the Munroe Crucible: ISAAC KING PHELPS.

The Weight of Carbon Dioxide with a Table of Calculated Values: S. W. PARR.

Ferric Nitrates in Aqueous Solutions: F. K. CAMERON and W. O. ROBINSON.

Review Phosphate Situation: F. K. CAMERON and J. M. BELL.

ORGANIC CHEMISTRY SECTION

S. F. Acree, chairman

Preparation of Benzophenone: J. BISHOP TINGLE and W. W. HOLLAND.

It is well known that the interaction of gases at moderately high temperatures is largely influenced by apparently small variations in the physical state of the containing vessel. These effects

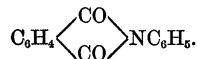
are usually described as "catalytic," but it is obviously very difficult in many cases to distinguish between a "catalytic" influence and one due only to an alteration in the thermal properties of the surface of the container. In the hope of throwing some light on the subject we have investigated the production of benzophenone by the distillation of calcium benzoate in a current of carbon dioxide. The calcium salt was mixed intimately with the substances mentioned below, the figures give the percentage yield of benzophenone. Unglazed porcelain, 30.4; carbon from arc light rods, 40.9; iron filings, 45.0; calcium carbonate and iron filings, 54.5; calcium carbonate and arc light rods, 50.0. These results are the mean of closely agreeing duplicates and express the yield percentage of the theoretical. The yield of benzophenone from benzene, aluminium chloride and benzoyl chloride is 42.8 per cent., according to Gattermann.

Studies in Nitration—VI., Synthesis of Certain Nitranilides: J. BISHOP TINGLE and C. E. BURKE.

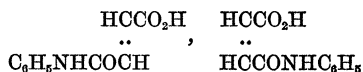
Work is in active progress on the synthesis of a number of nitrophenylamides, nitrophenylimides and nitrophenylamidic acids from *o*-, *m*- and *p*-nitraniline. In this manner it is hoped to identify some of the many compounds prepared by the senior author and Dr. F. C. Blanck by the nitration of the corresponding aniline derivatives. A description of the individual compounds thus far synthesized will appear in due course.

Aniline Derivatives of Certain Unsaturated Dibasic Acids of the Aliphatic Series: J. BISHOP TINGLE and S. J. BATES.

It has been shown by the senior author and his collaborators that succinilic acid, $C_6H_5NHCOC_2H_4CO_2H$, when treated with aniline yields succinidilide, $C_6H_5NHCOC_2H_4CH_2CONHC_6H_5$, whereas phthalanilic acid, $C_6H_5NHCOC_6H_4CO_2H$, under similar conditions is converted into the anil,



The investigation has now been extended to the aniline derivatives of maleic, fumaric and malic acids. Several new compounds have been prepared. A study is being made of the action of various amines on fumar-, male- and malanilic acids,

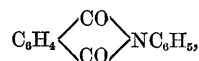


and $C_6H_5NHCOC_2H_4CH(OH)CH_2CO_2H$, respectively.

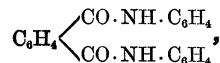
Rearrangement in the Phthalamidic Acid Series—

IV.: J. BISHOP TINGLE and B. F. PARLETT BRENTON.

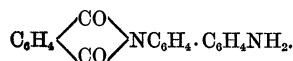
The work of Bishop Tingle and his collaborators on this subject has been extended. Phthal-di-phenylamidic acid, $(C_6H_5)_2NCOC_6H_4CO_2H$, when heated with pyridine at 100° gives *dipyridinium phthalate*, in 109° . Aniline transforms the acid into phthalanil,



whereas by the action of β -naphthylamine a mixture of phthalanil and phthal- β -naphthylamidic acid, $C_{10}H_7NHCOC_6H_4CO_2H$, is obtained. The following new acids have been prepared by the method described recently by Bishop Tingle and Rolker.¹ A study is being made of the action on them of various amines. *Phthalphenyl- β -naphthylamidic acid*, $C_6H_5N(C_{10}H_7)COC_6H_4CO_2H$, m. 115° . *Phthal-*p*-chlorophenylamidic acid*, $ClC_6H_4NHCOC_6H_4CO_2H$, m. 180° . *Phthal-diisobutylamidic acid*, $[(CH_3)_2CHCH_2]_2NCOC_6H_4CO_2H$, m. 153° . The product from diisobutylamine was tarry. Ethylaniline and methylaniline yielded the diamides $C_6H_4[CON(C_2H_5)C_2H_5]_2$ and $C_6H_4[CON(CH_3)CH_3]_2$, respectively, m. 144° and 181.5° . Two compounds have been prepared from benzidine and phthalic anhydride, both melt only at high temperatures. One appears to be the diamide or imide,

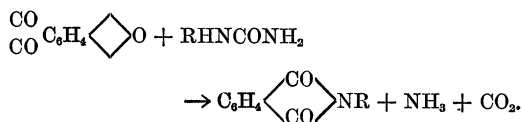


or



The other has not yet been investigated. *p*-amino-benzoic acid gives the *dibasic acid*, $HO_2CC_6H_4CONHC_6H_4CO_2H$, m. 271° .

The action of carbamide and its substitution products on phthalic anhydride has been made. It is found to take place according to the equation,



The compounds produced when $R=H$, C_6H_5 , $C_6H_5CH_2$, CH_3 and C_2H_5 have been investigated. Phenylthiocarbamide behaves in a similar manner, NH_3 and COS being evolved. Ethylidenecarbamide

¹ *Jour. Am. Chem. Soc.*, 30, 1882, 1908.

gives a tar. Form- β -naphthylide and phthalic anhydride yield formic acid and phthal- β -naphthylamide.

The Synthesis of Orthohydroxyazobenzene: WM. McPHERSON and H. J. LUCAS.

The synthesis of orthohydroxyazobenzene by the saponification of the compound obtained by the action of unsymmetrical benzoyl phenylhydrazine on orthobenzoquinone was described. The bearings of this synthesis on the constitution of the orthohydroxazo compounds was also discussed.

Occurrence of Diterpenes in Camphor Oil: ALFRED HOFFMAN.

The so-called "blue, thickened" camphor oil of commerce, which consists of the highest boiling parts of camphor oil, contains in its highest fraction a few per cent. of a hydrocarbon $C_{20}H_{32}$. Purified by distillation over metallic sodium, it is a colorless, mobile liquid of faint odor and the following physical properties: b. 20 mm. = 195–205°, b. 760 mm. = 315–320° with slight decomposition, $\alpha_D = +6^\circ 49'$, $d_{24} = 0.902$, $n_D = 1.5024$, molecular refraction for $C_{20}H_{32}$ with three double bonds, found 88.94, calculated 88.77. This would point to its being bicyclic. It does not resinify on standing, can be distilled with steam and is unsaturated toward potassium permanganate and bromine, adding about six atoms of the latter. This seems to be the first instance of a hydrocarbon with such a high boiling-point being found in a natural essential oil.

The Condensation of Acetone with Calcium Oxide: ALFRED HOFFMAN.

The formation of mesityl-oxyl, isophoron and the xylitons from acetone under the influence of calcium oxide has been studied by a number of chemists and the constitution of the products established. The present article deals with the mechanism of the reaction. Briefly, it was found that the simplest condensation product, mesityl-oxyl, was formed first, and from it alone or with acetone the more complicated ones. It was also shown that the first step in the reaction in all cases is an aldol condensation under the influence of the small quantities of calcium hydroxide usually present as impurity. Then water is split off to form the known condensation product. Thus, with perfectly pure calcium oxyl no condensation takes place, even on heating under pressure. In the simplest case, that of acetone to mesityl-oxide, the intermediate product could be isolated and was shown to be the alcohol diacetone which has already been described as a product of the action of alkalis on acetone.

5-Brom-2-Aminobenzoic Acid: ALVIN S. WHEELER.

Trichlorethylidene-o-aminobenzoic acid on bromination in glacial acetic acid gives a high yield of 5-brom-2-aminobenzoic acid which is converted into the free base by water. Direct bromination of anthranilic acid under like conditions gives a less pure product. A detailed comparison of the two methods will soon be completed.

Fixation of Labile Hydrogen Atoms by Chloral: ALVIN S. WHEELER and STROWD JORDAN.

The condensation of chloral with primary aromatic amines gives compounds of the type $CCl_3CH(NHPh)_2$. Substituted amines may be used, but these are limited to those containing not more than two negative elements or groups in the benzene nucleus. All such compounds on bromination split off chloral and give brominated amines. A quantitative study is being made, comparing this method with the direct bromination of amines. The reactions proceed best in glacial acetic acid.

The Anhydride of Chlorterephthalic Acid: JOHN E. BUCHER.

This acid easily forms an anhydride ($C_8H_5ClO_3$)₂ on treatment with acetic anhydride. Molecular weight determinations indicate that the value of α is very high.

The Oxidation of 1-Phenylnaphthalene Derivatives to Benzenepentacarboxylic Acid: JOHN E. BUCHER.

A number of anhydrides obtained by the action of acetic anhydride on phenylpropionic acid were oxidized to benzenepentacarboxylic acid. This reaction shows that they are derivatives of 1-phenylnaphthalenedicarboxylic anhydride. In the final oxidation which was carried on in fuming nitric acid, it was necessary to use manganese nitrate as a catalytic agent.

Abstracts have not been received for the following papers:

Studies in Catalysis: S. F. ACREE.

Studies in Tautomerism: S. F. ACREE.

The Alkylation of Tautomeric Acids: SIDNEY NIEDLINGER.

The Catalytic Formation of Esters from Amides and Alcohols in the Presence of Acids: E. E. REID.

The Catalytic Hydrolysis of Amides by Acids and Alkalies: E. E. REID.

On the Determination of Halogens in Organic Compounds: C. W. BACON.

Rearrangements in the Camphor Series: Isocampholactone: W. A. NOYES and A. W. HOMBERGER.

The Addition of Acetic Acid to Unsaturated Hydrocarbons: EDWARD KREMEERS.

The Esterification Law and Steric Hindrance Hypothesis: M. A. ROSANOFF and W. L. PARGER.

A New Method for Detecting Mutarotation: C. S. HUDSON.

Alkylation of Cyanacetic Ether: JOHN C. HESSLER.

The Theory of Indicators and the Reactions of Phthaleins and their Salts: E. A. SLAGLE.

The Mechanism of Oxime Formation and Hydrolysis: L. JUNIUS DESHA.

The Determination of Acid Radicals in Esters of Cellulose: R. G. WOODBRIDGE, JR., and F. J. MOORE.

The Condensation of Nitromalonic Aldehyde with Urea: WILLIAM J. HALE.

Some New Terpene Derivations: GEO. B. FRANKFORTER.

The γ - γ' Diketonic Acids: J. B. GARNER.

Further Studies in Catalysis in Ester Formation: ISAAC KING PHELPS.

Removal of Plant Food from Soil by Plants: F. K. CAMERON and J. G. SMITH.

PHYSICAL CHEMISTRY SECTION

Gilbert N. Lewis, chairman

The Behavior of the Nickel Anode: E. P. SCHOCH.

Starting at the equilibrium potential of nickel in neutral nickel sulphate solution, and polarizing anodically with gradually increasing current densities, the author found that nickel showed what may be called "normal" anodic behavior with very small current densities, but that with larger current densities the active surface appears to be diminished. This diminution of the active surface is due to the discharge of oxygen; and the whole behavior of the nickel anode with large current densities is due to the relation of the areas of the active to the impaired spots. This presents the phenomenon of porosity in a new light.

The Temperature Coefficient of the Conductivity at Infinite Dilution: JOHN JOHNSTON.

Value of Λ_0 at a series of temperatures ranging between 0° and 156° were obtained for a number of salts by extrapolating with the aid of the function $1/\Lambda = 1/\Lambda_0 + K(CA)^n$, values of n being chosen so that the graphs were nearly linear. From these were derived values of l , the mobilities of the separate ions. On plotting the values of $\log l$ at the various temperatures against the logarithms of the numerical values of the fluidity of water at the corresponding temperatures, straight lines were obtained for all the ions investigated, with the exception of H^+ and OH^- ,

where, indeed, abnormality might be expected, as these two ions occupy a quite especial position when water is the solvent. For the others (thirteen in number, including uni-, di-, tri- and quadrivalent ions), the derivations from linearity are not greater than the error of the separate determinations. Thus this method presents a very convenient means of obtaining the value of l at any intermediate temperature, or of calculating its temperature coefficient, since the temperature coefficient of the fluidity of water is known and may be expressed by a fairly simple formula.

The Change in Refractive Index with Temperature —I.: K. GEORGE FALK.

The refractive indices for the three hydrogen and the sodium lines and the density of diisobutyl, *n*-heptyl alcohol, benzyl alcohol, dimethylaniline, *n*-butyric acid and acetylacetone were determined at a large number of temperatures between 20° and 70°. The variation was found to be a straight line function of the temperature for all. The change in the refractive powers, using the expressions $n^2 - 1/d$, $n - 1/d$, $n^2 - 1/(n^2 + 2)d$, were also calculated. Ethyl acetate gave results indicating a change in the equilibrium between the tautomeric forms at higher temperatures.

A Modified Oxyhydrogen Gas Coulometer: J. W. TURBENTINE.

The Walter-Neumann, single tube, oxyhydrogen gas coulometer, with adjustable leveling tube, has been modified, so that the platinum electrodes, in the old form fastened to a short length of platinum wire which was sealed in the glass walls of the coulometer and terminated on the outside in a small loop, are sealed in glass tubes and are inserted into the coulometer through rubber stoppers held in side arms.

Objectionable features of old form: (1) Electrical connection was made with coulometer by hooking wires in the loops. This gave poor contact and high local resistance and (2) consequent heating which caused alternate expansion and contraction, and soon resulted in the cracking of the glass and the breaking out of the electrodes, (3) or the platinum loops soon broke off. (4) In either case the apparatus became useless and the platinum electrodes had to be discarded.

Advantages claimed for the modified form: (1) Electrodes are adjustable and (2) may be removed and cleaned. (3) Due to the elimination of the fragile seal in the wall of the main tube, the apparatus is more durable. (4) In case of breakage, the platinum parts are not "scrapped," but are transferred to a new tube. This requires the

purchase in such a case of glass parts only. (5) Electrical connection is made through a length of copper wire. Good contact may then be got by means of screw connectors.

The Rapid Precipitation of Metals on Gauze Cathodes with Fixed Electrodes: JOHN T. STODDARD.

Cadmium, copper, nickel, silver, zinc and probably other metals may be quantitatively precipitated for their solutions upon a fixed gauze cathode, with a fixed anode in about the same time as that required when rotating electrodes are employed. The current used is about the same as in the latter method.

The cylindrical cathode, 3 cm. in diameter and 3 cm. high, is made of platinum gauze, described by the maker as 52-mesh and made of 0.004 inch wire. Its total surface is calculated to be about 40 sq. cm. The anode is a cylinder of platinum foil, about 2.5 cm. high and of a diameter which may vary between 0.5 and 1.2 cm.

It is placed concentrically within the gauze cathode. The electrolysis is carried out in a 80 c.c. beaker with about 50 c.c. of solution, in order to gain the advantage of concentration. The current strength may vary within wide limits in most cases without influencing the character of the deposits, but the time is greatly shortened only when comparatively high currents are used.

It appears that the more or less troublesome and expensive arrangements for rotating one of the electrodes, or of agitating or rotating the solution by mechanical means or by the use of a magnetic field are quite unnecessary for rapid and complete precipitation.

The character of the deposited metals is excellent, and entirely satisfactory analyses have been made by the method described above.

The Rapid Precipitation of Metals in a Mercury Cathode with Fixed Anode: JOHN T. STODDARD.

Cadmium, copper, nickel, silver, zinc and probably other metals can be precipitated in a mercury cathode with a fixed anode in substantially the same time as that required with the use of a rotating anode. The anode is a flat spiral of platinum wire, and it is placed 1.05 cm. from and parallel to the surface of the mercury in a 50 c.c. beaker. The cathode connection is made by a platinum wire, which is protected from the solution by a small glass tube sealed to it 2-3 mm. from the end, which dips into the mercury.

The solution may have any volume from 10 c.c. to 30 c.c. The strength of current is limited only by the danger of loss from too violent boiling of

the solution. About 40 g. of mercury are used as cathode.

The following table shows the time necessary for complete precipitation of the metals:

Metal	Approx. Amount	Current Strength	Time in Minutes
Cadmium	0.21 g.	5 Amp.	10
Copper	0.4	4	8
Nickel	0.2	6	12
Nickel	0.5	7	15
Silver	0.5	8	7
Zinc	0.4	6	15

Analyses made by this method give satisfactory results, concordant with those made from the same solutions with gauze cathode and fixed anode.

Some New Laboratory Apparatus: JOHN T. STODDARD.

1. The wire-test-tube holder, described by the writer in the *Journal of Analytical Chemistry*, January, 1890, is used as the clamp on a light stand. The clamp is adjustable at any angle and up to 10½ inches in height above the table. The support is well adapted to many services in the laboratory and has great stability from the special design of its base.

2. A funnel support which fits on the above stand consists of circular plate of aluminium with openings for the reception of four funnels. The special base of the stand insures stability for a much greater load than the funnels when full of solution. Its chief advantage is compactness.

3. A wire dish holder, which grasps an evaporating dish by the edge and holds it securely.

Abstracts have not been received for the following papers:

A New Method of Determining the Partial Vapor Pressures of Binary Mixtures: M. A. ROSANOFF and ARTHUR B. LAMB.

On the Partial Vapor Pressures of Binary Mixtures: M. A. ROSANOFF and C. W. EASLEY.

Recent Evidence for the Existence of Hydrates in Aqueous Solutions: H. C. JONES.

A New Law concerning the Vapor Pressures of Binary Mixtures: M. A. ROSANOFF.

On the Duhem-Margules Equation as applied to Binary and Ternary Mixtures: WILLIAM EDWARD STORY.

Preparation of Pure Hydrogen and the Elimination of Oxygen: GEO. A. HULETT.

A Maximum Volt Meter: W. LASH MILLER.

The Relations between Viscosity and Fluidity: EUGENE C. BINGHAM.

A New Method of Measuring Association by Means of Fluidity Data: EUGENE C. BINGHAM.

A Simplification of the Cyclical Process Method for Deriving Thermodynamic Equations: E. W. WASHBURN.

Cuprous Hydroxide: W. D. BANCROFT.

Osmotic Studies: L. KAHLENBERG.

Crystallization through Membranes: J. H. WALTON.

An Explanation of the Negative Coefficient of Expansion of Silver Iodide: GRINNELL JONES.

The Significance of certain Numerical Relations in the Sugar Group: C. S. HUDSON.

The Formation of Nitric Oxide by the Action of Nernst Glowlers on Air: IRVING LANGMUIR.

The Potential of the Sodium Electrode: G. N. LEWIS and C. A. KRAUS.

The Reaction Velocity of an Inorganic Hydrolysis: S. C. LIND.

The Solubility of Salts in Concentrated Acids: ARTHUR E. HILL and JOHN L. SIMMONS.

Transition from Metallic to Electrolytic Conduction: C. A. KRAUS.

A Dilution Law applicable to both Aqueous and Non-aqueous Solutions: C. A. KRAUS.

Equilibrium in Solutions containing Copper and Iodine: W. C. BRAY and G. M. J. MACKAY.

The Properties of Water near the Critical Point: R. C. MAILEY.

The Internal Heat of Vaporization: J. E. MILLS.

The Molecular Masses of Liquids: G. H. MEEKER.

Some Applications of the Phase Rule as a Means for Determining Water in Certain Organic Substances: S. W. PARR and F. W. BLISS.

Heat Conductance of Soils: H. E. PATTEN.

B. E. CURRY,

NEW HAMPSHIRE COLLEGE Press Secretary

Transmitted by C. H. HERTY,

Secretary of Section C

SOCIETIES AND ACADEMIES

THE TORREY BOTANICAL CLUB

THE meeting of December 8, 1908, was held at the American Museum of Natural History, President Rusby in the chair. About seventy-five persons were present. The announced scientific paper of the evening on "Mechanical Response of Plants" was then presented by Sir Jagadis Chunder Bose, professor in the Presidency College of Calcutta and author of "Response in the Living and Non-Living," "Plant Response as a Means of Physiological Investigation," etc. The presentation of the subject was accompanied by an exhibition of some of the ingenious and delicately

contrived apparatus constructed by Professor Bose for the purpose of measuring and recording the responses of plants to various stimuli. Following is an abstract of the paper compiled from notes furnished by Professor Bose:

The effect of stimulus impinging on a responding tissue is to induce a fundamental molecular derangement. This condition of derangement constitutes excitation. On the cessation of stimulus, there is a slow recovery, the tissue returning to its original condition. This molecular reaction is itself beyond our scrutiny, but it may be shown that we can gauge its intensity and extent by the observation and record of certain concomitant changes induced by it in the responding tissue. Among these are (1) changes of form, manifested as mechanical response, and (2) changes of electrical condition, which may be recorded as electrical response.

The intensity of the responsive change will obviously depend on the two factors of strength of stimulus and physiological condition of the tissue. Hence, when stimulus is constant, the amplitude of response gives us a measure of the physiological condition. Now we know that the changing environment must induce unknown changes in this physiological condition, of which there is no outward sign. But we are here enabled to make the plant itself reveal its condition, by the reply it makes to the blow of a stimulus. A stimulating agent will exalt, and a depressing agent diminish or abolish, this response. We have thus a means of attacking the deeper problem of the physiological variation in an organism.

The speaker had been able to overcome the numerous difficulties which occur in connection with the automatic recording of the mechanical response of the plant, by devising three types of instrument. These are (1) the oscillating recorder, (2) the optical lever and (3) the balanced crescograph.

In the oscillating recorder, the recording lever is made of light aluminum wire and is suspended vertically on jewelled bearings. This lever is L-shaped, and the shorter arm, at right angles to the longer, is attached to the responding leaf. The great advantage conferred by the oscillating recorder lies in the fact that the friction of the writing point against the recording surface is practically eliminated. The source of friction in such arrangements arises from permanence of this contact. In this instrument, however, the writing lever is virtually free, except for the brief intervals in which the smoked glass surface is brought into periodic contact with it. For these records,